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ABSTRACT

Activities in the fourth quarter of the fiscal year 1969-70 concentrated on the USOE site team visit and on implementation of the team's planning recommendations. In a background paper and a preliminary program plan submitted to USOE, the importance of continuing emphasis on developmental psychology was stressed. The center learned in December 1969 that its contract would terminate in June 1970. This document contains the preliminary program plan, the background paper, a 130-entry bibliography of the center's projects (1966-1969), a copy of the USOE letter indicating contract termination, and a statement of the scope of the center's work during the phaseout period. (DE)

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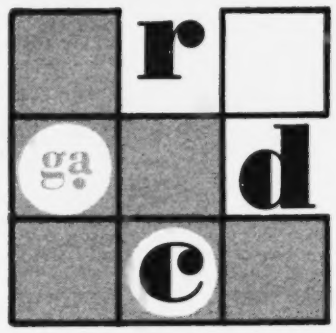

Research and Development Center in Educational Stimulation

QUARTERLY REPORT
TO
THE UNITED STATES
OFFICE OF EDUCATION

JANUARY 31, 1970

EA 002 811

UNIVERSITY OF GEORGIA

ATHENS, GEORGIA

ED0 396632

BR-5-0250
Report 19
PA-24
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QUARTERLY PROGRESS REPORT:

RESEARCH AND DEVELOPMENT CENTER IN EDUCATIONAL STIMULATION

The University of Georgia
Athens, Georgia

to

THE UNITED STATES OFFICE OF EDUCATION

Report Number 19
November 1, 1969 to January 31, 1970

Center Number 5-0250
Contract Number OE 6-10-061

Executive Committee of the
University Advisory Board
Joseph A. Williams
Warren G. Findley
Stanley H. Ainsworth

Director
Eugene M. Boyce

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SITUATION REPORT
FOR THE QUARTER ENDING JANUARY 31, 1970

Activities in the fourth quarter of the fiscal year 1969-70 at the Research and Development Center were concentrated around the USOE site team visit which took place November 3-5 and upon implementing the team's recommendations for planning. In the feedback session the site team recognized the need for additional planning activities which would bring into clearer focus the plan of action of the Georgia Research and Development Center.

From November 5-20 extensive planning sessions were held in accordance with the directions given by the site team for immediate action. Participants in these planning sessions included the personnel that the site team considered necessary for the successful completion of this task.

The continuing shift of emphasis to a developmental psychology approach was outlined and the preliminary Program Plan (Appendix I) was submitted to the Office of Education and to Dr. Brickell, the site team leader, no November 21, 1969.

During the remainder of November and the first weeks of December, additional details were built into the new program. A progress report, explaining further deliberations of the planning group, was sent to Dr. Ward Mason on December 10, 1969 (Appendix II).

On December 29, 1969, the Center was informed that the contract would terminate on June 30, 1970. This decision was confirmed by a letter from

Dr. Ward Mason (Appendix III). At the request of the Office of Education, the scope of work for the remainder of the existing contract was prepared. This scope of work is found in Appendix IV.

On January 20, 1970, Center personnel visited the Office of Education and negotiated the contract for the remaining months.

PUBLICATIONS

Occasional/Theoretical Papers

No. 7 Implications of Early Stimulation for Teacher Education in Reading
by George E. Mason

No. 9 Developmental Changes in the Use of Verbal, Concrete-Perceptual and Spatial-Positional Stimulus Information
by David A. Corsini

Practical Papers

No. 4 A Bibliography of Tests of Motor Ability, Physical Fitness and Health for Children Ages Three to Twelve Years
by Billy Gober

No. 22 Games for Initial Reading
by George E. Mason and Billy Gober

No. 25 Preprimary Physical Education Through Movement Exploration
by Billy Gober, Larry Albertson, Pearl Pettersen, and Bernadine Brady

No. 26 Primary School Physical Education Through Movement Exploration
by Billy E. Gober, Larry Albertson, Pearl Pettersen, and Bernadine Brady

No. 27 Geometry
by Michael L. Mahaffey

No. 29 Supplementary Mathematics Material
by William D. McKillip and Henry C. Hartje

No. 30 Instructional Program in Standard English - Unit IV: Teaching the Modal WILL
by Richard C. Rystrom, Marjorie Farris, and Judy Smith

No. 31 Unit Mastery Tests for Written Language - Levels A Through F
by George E. Mason, William Blanton, Sally Duhling, and Joyce Murless

No. 32 Patterns
by William D. McKillip

Practical Papers (Continued)

No. 34 Selected Aspects of Cognitive Thinking as a Process in Teaching Art Appreciation in the Elementary Grades: Book I

No. 34 Selected Aspects of Cognitive Thinking as a Process in Teaching Art Appreciation in the Elementary Grades: Book II

Reprints and Preprints

No. 19 Testing Negro-Standard English Dialect Differences
by Richard C. Rystrom

No. 21 Evaluating Letter Discrimination Problems in the Primary Grades
by Richard C. Rystrom

No. 22 Developmental Changes in the Effect of Nonverbal Cues on Retention
by David A. Corsini

No. 23 The Effect of Nonverbal Cues on the Retention of Kindergarten Children
by David A. Corsini

Research Papers

No. 12 A Survey of Some Conditions Relevant to the Teaching of Mathematics in the Elementary Schools of the State of Georgia
by Douglas K. Brumbaugh and Joseph R. Hooten

No. 14 Children's Ability to Reproduce Space Relations as a Function of Transformation of Field Configuration and Perceptual Mode
by Charles D. Smock and Charlotte D. Cox

No. 15 Developmental Changes in Problem-Solving Strategies: Permutation
by Sonia Leskow and Charles D. Smock

No. 17 An Investigation in the Learning of Equivalence and Order Relations by Four- and Five-Year-Old Children
by Russell L. Carey and Leslie P. Steffe

No. 18 The Effect of Academic Course Placement Upon the Composition of Physical Education Classes of Twelve-Year-Olds
by Billy Gober

No. 19 Wray Behavior Scale
by Grace A. Wray

Technical Papers

No. 9 The Development of an Experimental Standardized Instrument for Measuring Composition Ability in Young Children
by L. Ramon Veal and Edieann Biesbrock

PROGRESS REPORT ON PLANNING ACTIVITIES:

RESEARCH AND DEVELOPMENT CENTER
IN EDUCATIONAL STIMULATION
The University of Georgia
Athens, Georgia

November 21, 1969

Center Number 5-0250
Contract Number OE 6-10-061

Executive Committee on the
Local Advisory Board
Joseph A. Williams
Warren G. Findley
Stanley H. Ainsworth

Director
Eugene M. Boyce

I. CENTER'S RESPONSE TO SITE TEAM RECOMMENDATIONS

The recommendation that the Georgia R&D Center enter into a 60- to 90-day intensive-planning period to begin immediately, was made as the climax of an oral report by the Site Team Chairman, Dr. Henry Brickell, on Wednesday afternoon, November 5, 1969 (see Appendix A--Background). The following is a transcript of a section of the notes taken by the Center Director:

> We recommend that you go into a period of 60-90 days of intensive planning--very demanding. A short period would be more effective than if the planning were spread out over a year. You could not succeed in a new plan without a full-time developmental psychologist to generate the heart of what you propose to do. We recommend that you examine the list of ten projects in developmental psychology to see if they are really central to your purpose. An outside planner would be invaluable.
>
> The Plan would project five years' work with two years in detail, show a schedule of activities, dates when things would be completed. It would list the programs at the end of five years. A listing of knowledge areas should be considered--a detailed time table of activities should be placed against this plan. Planning must be done together--substantive programmers with the developmental psychologists.
>
> We mean 4, 5, 6, 7 men working together. Present staff to be supplemented--and to begin immediately.

The Site Visit of the Georgia R&D Center took place November 3 to 5, 1969. On November 6 and 7, Dr. Eugene Boyce (Center Director) and Dr. Stanley Ainsworth (Associate Dean for Research and Graduate Studies, College of Education, and member of the Center's Local Advisory Board) met to study the report of the Site Team and to lay out a strategy for the immediate implementation of the recommendations. There was one specific recommendation, that intensive planning begin immediately. Other recommendations were implied in the content of the report.

It was agreed that the basic planning group would consist of those who were responsible for the intensive planning prior to the Site Visit.

In addition, Dr. Kathryn Blake* would be asked to serve as full-time planning consultant during the intensive planning period. Dr. Ainsworth also agreed to serve. Outside consultants would be invited to assist in each major area under consideration.

Three critical dates were recognized in the new 90-day planning period:

(a) November 24 is the date when Site Team chairmen for all nine R&D Centers meet with R&D/Washington officials to make their recomendations. It was assumed that since the recommendation was made that the planning of the Georgia Center begin immediately, it would be appropriate to submit a progress report, prior to November 24, to Dr. Henry Brickell, Chairman of the Georgia Center Site Team and to Dr. Ward Mason, Chief of the R&D Centers Branch, Office of Education. This report might consist of a statement of focus and objectives with the appropriate supporting rationale. Included should be a general overview of the anticipated 90-day planning period.

(b) December 15 was fixed as the date when the plan should have progressed to the point where a detailed budget could be made.

(c) February 3 would be the last day of the 90-day period. However, the total plan would necessarily be substantially complete before January, 1970, since that month has been set aside for contract negotiations.

During the period November 10 through November 20 the planning group worked full time on this planning task. The group consisted of:

Dr. Stanley H. Ainsworth, Associate Dean for Research and Graduate Studies, College of Education, University of Georgia, and member of the Local Advisory Board of the R&D Center, with review responsibilities for administrative decisions;

Dr. Kathryn A. Blake, Professor of Special Education, College of Education, University of Georgia, and Consultant on Evaluation and Program Planning, R&D Center;

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*Dr. Blake, Professor of Special Education, University of Georgia, received her Ph.D. from Syracuse in 1957. She was formerly Associate Director for Basic and Applied Research in the Georgia R&D Center. With Dr. Charlotte Williams she submitted in the fall of 1969 an application to the National Laboratory on Early Childhood Education Center for the Handicapped. This application was considered by many to be a masterpiece of planning. She has been the recipient of eleven research grants from the Office of Education.

Dr. Eugene M. Boyce, Director of the R&D Center from January 1, 1969;

Dr. David A. Corsini, Associate Professor of Psychology, University of Georgia, and Liaison for Follow Through, R&D Center;

Dr. Carl J. Huberty, Coordinator for Measurement and Statistics, R&D Center;

Dr. Everett T. Keach, Associate Director for Substantive Programs and Coordinator of the Social Science Program, R&D Center;

Dr. George E. Mason, Coordinator of the Language Arts Program, R&D Center;

Dr. William D. McKillip, Coordinator of the Mathematics Program, R&D Center;

Dr. D. Keith Osborn, Liaison, Early Childhood Education, College of Education, School of Home Economics, R&D Center, University of Georgia;

Dr. Charles D. Smock, Associate Director of the R&D Center responsible for the Developmental Psychology Program;

Dr. Murray H. Tillman, Assistant Professor of Education, University of Georgia, and researcher in the area of Developmental Psychology, R&D Center.

A basic pattern of work during the two-week period November 10-20 began to take shape as follows:

1. Agreement was reached regarding a framework for planning based on an analysis of the oral report given by Dr. Brickell on November 5;

2. Discussions were initiated with a view to building common understanding of the meaning of "cognitive process" and the relationships that should exist between the subject areas, developmental psychology, and evaluation.

3. A number of journal articles were identified, duplicated, and studied by each member of the planning group in order to form a common knowledge base for discussion.

4. The nature and characteristics of an efficient design for planning were examined.

5. The developmental psychology specialist presented a statement of the focus, rationale, and objectives of the Center. A basic paper was produced, discussed, and rewritten twice. This was considered the basic document out of which all other documents would be developed.

6. Progress was made toward becoming specific in terms of an operational program. Illustrations were written, criticized, and rewritten.

7. On the morning of Wednesday, November 19, the work accomplished was consolidated into a written account to be presented to Dr. Ward Mason in Washington on Friday morning, November 21, and to Dr. Henry Brickell in New York on Friday afternoon.

During the two weeks of planning (November 10-20) a number of decisions were made, and a number of actions were initiated as immediate follow-up to the recommendations of the Site Team concerning:

(a) the coordination of research and development;

(b) the feedback to program from in-house research;

(c) the structure of university support;

(d) consultants for the intensive planning period;

(e) longitudinal studies on the accumulated data of the Center; and

(f) full-time personnel.

The Coordination of Research and Development. Solutions to the problems of coordination of research and development are to be found in the basic plan of work growing out of a true programmatic emphasis. Coordination will be achieved by a series of interrelated activities.

(a) Two in-house seminars will be held each week: one dealing with the theoretical base of operations that give ultimate directions in long-term planning; and one on specific program plans and reports.

(b) Quarterly conferences will be held involving two or three outside consultants. These conferences will deal with specific topics that are critical to program development and will serve as focal points for major decisions.

(c) Two conferences will be conducted each year to continue to build up our knowledge base and bring together the thinking of national leaders on a given topic. A monograph will be published summarizing the papers presented.

(d) A research library will be established in the R&D building with a full-time research librarian. This library will bring together the output of other R&D centers, regional laboratories,

early childhood centers, and other appropriate research centers and institutes. Other materials to be collected in this library will fill the gap between the personal library of the research and development worker and the central campus library.

(e) A tight formative evaluation system is being established. The feedback processes in this system will expose irrelevant activities and identify important factors to be strengthened.

Feedback to Program from In-house Research. Much of the basic and applied research done in the past in the Georgia R&D Center is directly related to the building of a firm developmental psychology platform. Dr. Murray H. Tillman is in the process of extracting pertinent material from these studies for direct application in our program. Some of the results of this work are found in Appendix B to this report.

The Structure of the University Support. There has been a reexamination of the relationships between the R&D budgets as they affect the work style of faculty attached to the R&D Center. In the university budget now under consideration some shifts have been made from departmental budgets to "the Associate Dean's budget." The Associate Dean's budget is directly controlled by Dr. Ainsworth, who is the official liaison between the R&D Center and all parts of the university. R&D personnel on the Associate Dean's budget will have the same security of tenure as faculty members on a departmental payroll. Dr. Ainsworth will retain the initiative in the allocation of departmental duties. Complete R&D Center control of faculty is not desirable because this could weaken the unique contribution of the university. Other possible improvements are being examined.

Consultants for the Intensive Planning Period. The planning group has contacted experts in several fields relevant to our program. Dr. Irving Sigel (former Director of Research, Merrill-Palmer Institute and now Chairman, Developmental Psychology, University of Buffalo, N.Y.) and Dr. William Meyer (Director, National Laboratory for Early Childhood Education, Syracuse University, N.Y.) are scheduled to visit the Georgia Center during the first 30-60 days of planning. Other consultants in developmental psychology and early childhood education (e.g., Drs. S. White, Kohlberg, Weikart, Elkind, and Flavell) will be scheduled for visits during the 60-180 day planning period.

Longitudinal Studies on the Accumulated Data of the Center. Over the past months there has been an intensive effort to organize Center data in a data bank. This data has been classified and stored on tape or cards as appropriate. Dr. Carl Huberty was employed this fall to serve as Acting Coordinator for Evaluation. He is giving major attention to the analysis of the data on hand.

Full-time Personnel. The site team report pointed out the need for a full-time developmental psychologist. Implicit in the decision to work from a developmental psychology platform is the strengthening of that dimension of the program. We plan for a staff of three psychologists, two to be added at the beginning of the fiscal year and one at a later date. Although Dr. Smock, Associate Director for Developmental Psychology, is listed as half-time in the Center, he has worked as if he were full-time in center activities during the intensive planning period beginning last spring.

II. PLANNING SYSTEM

A complete planning system will be developed. Work on this system will begin immediately to specify the tasks to be accomplished and outline work-breakdown structures to guide work on each task. The material below is an illustration of some lines which will be developed in planning the organization and program.

Organization

An organization must be planned and mounted. This organization will consist of structures and functions to undergird the program. Some tasks related to organization are the following:

1. Specify coordination system
    a. Decision-making strategies
    b. Resource-allocation strategies
    c. Scheduling strategies and procedures
    d. Communication procedures
    e. Budget allocation and control procedures
2. Specify organizational structure
3. Plan support services
    a. Dissemination
    b. Data processing
    c. Budget management
    d. Materials production
    e. Publications
    f. Arrangements with schools

Program

Some tasks to be undertaken in developing the program will specify focus, develop rationale, identify need, specify objectives, codify knowledge base, plan a set of projects, plan and conduct projects, and prepare packages of prototypical educational materials. These tasks are expanded briefly below.

1. Specify Focus
    a. State goal
    b. Identify target population
    c. Make summary statement about expected end-products
    d. Specify criteria for goal attainment
2. Develop Rationale
    a. Cite theoretical base
    b. Cite empirical base
    c. Propose implications for Center focus
3. Identify Need
    a. Identify ECE problem
    b. Specify lack, or conflict, in current activities regarding need/problem
    c. Specify how Center activities contribute to solution of problem
4. Specify Objectives
    a. Long-term objectives
    b. Short-term objectives

5. Codify Knowledge Base

   a. Choose dependent variables: the logical thought processes

      i. List the logical thought processes of concern in the CA 3-8 period

      ii. Apply appropriate criteria to select thought processes of concern in Center

      iii. Define the selected thought processes

      iv. For each thought process, specify task steps in development of process, i.e., behaviorally defined subgoals for each process

      v. For each behaviorally defined subgoal, specify desired terminal performance, a corresponding valid response measure, and the criterion for judging that the desired terminal performance is attained

   b. Choose independent subject variables: the child's behavior (action) structures

      i. For each subgoal, specify behavior structures prerequisite for the child's benefiting from training

      ii. For each prerequisite behavior structure, specify required level of performance, a valid response measure, and the criterion for judging that the required performance level is attained

   c. Choose independent task and treatment variables: the input from social studies, mathematics, and language arts

      i. For each subgoal, specify content vehicle from social studies, mathematics, and language arts, respectively

      ii. For each subgoal-content vehicle, specify relevant variables, i.e., task (types of materials, etc.) and treatment (sequence, etc.) variables

   d. Documentation

      Obtain information from literature, consulting scholars, and site visits regarding the following:

      i. Research results related to the dependent and independent variables

ii. Past and current educational programs (in the United States) concerned with the dependent variables

6. Plan a set of projects on variables influencing development of logical thought (Objective 1) and prototypical instructional programs (Objective 2)

   a. Specify needed studies

      Examine codified knowledge base. Apply appropriate criteria for the following:

      i. Identify variables where research data are still needed: i.e., where knowledge base is insufficient for development activities

      ii. Identify variables where research data are available and development activities are needed: i.e., where base is sufficient but training activities have not been developed and/or field-tested

      iii. Identify variables where no research or development activities are needed: i.e., where programs currently (or previously) are extant

   b. Organize plan

      i. Apply resource allocation criteria to establish priorities among projects

      ii. Phase projects on a time dimension on basis of appropriate criteria

      iii. Specify precisely the characteristics of and target dates for the expected end-products

7. Plan and Conduct Projects

   a. Research

   b. Development

   c. Field testing

8. Prepare packages of prototypical educational materials

Example of Work-Breakdown Structure

Once the tasks are specified, work-breakdown structures will be prepared to guide work on the tasks. At a minimum, these work-breakdown structures will show the steps to be used in accomplishing the tasks, personnel involved, time schedules and target dates for milestone events, expected end-products, and quality control. An example of a preliminary work-breakdown structure for one task, i.e., to specify rationale, is cited below.

Work-Breakdown Structure: Rationale for Program

1. Specify rationale (see outline for tasks in program development)

2. Task

   (a) Cite theoretical base

   (b) Cite empirical base

   (c) Propose implications for Center focus

3. Steps

   (a) Collect, review, and integrate literature

   (b) Synthesize literature with Center focus and objectives

   (c) Prepare draft of paper describing rationale

   (d) Get feedback on draft from planning group

   (e) Revise draft. Continue revision-feedback stage until fairly final draft is completed.

   (f) Get feedback on draft from consultants inside and outside university

5. Personnel

   (a) Center

   Leader--Smock

   Reactions--Planning group

(b) University consultants--K. Osborn, Corsini

National Consultants--Weikart, Sigel

5. Time schedule/target date

(a) Rough draft: November 20

(b) Final draft: December 20

6. Expected end-products

(a) Internal working paper

(b) Publication: Child Development Monographs

7. Quality control

(a) Criteria for evaluation

(b) Procedure for evaluation

III. FOCUS, RATIONAL, AND OBJECTIVES

Focus

The results of recent research and development activities (Chase, 1968; Miller, 1969) including the Georgia Center (Smock, 1968; Annual Report, 1969), clearly indicate the need for: (1) a better understanding of the basic processes of cognitive development and learning during the years 3 to 8; and (2) research and development activities designed to delineate the influence of specific environmental structures and sequentiality of cognitive acquisition on the development of conceptual processes.

The R&D Center's current focus is on the effects of early, sequential, and structured environmental stimulation on the development of logical thought processes. The question is not whether we can teach a particular skill, or accelerate cognitive learning but, rather, to discover the mechanisms and conditions of transition from one level of cognitive organization to a higher one. We want to know how knowledge of these mechanisms can contribute to the construction of education-environmental conditions that provide optimal short- and long-range behavioral outcomes. The target populations are children 3 to 8 years of age of varying cultural, social, and economic backgrounds and the personnel responsible for implementing early childhood educational models.

The goal, or expected end-product, for the coming five-year period is a disseminated set of theoretical research and technical papers that provide the rationale and empirical base for the description of prototypical instructional procedures effective in promoting the growth of logical thought through sequentially structured learning experiences relevant to the physical, social, and linguistic environments. The criteria for effectiveness are mastery level and cognitive developmental change in terms of either "horizontal decalage" (i.e., integration of concepts at a higher level of functioning) depending upon the specific process being studied or the presumed short- and/or long-range effects on cognitive development.

Rationale

The work of this Center is focused on the environmental and experimental variables that influence the development of logical thought because of its theoretical, empirical, and social relevance to the constructional models for young children.

Theoretically, it has become clear in the past decade that cognitive development specifically, and child development generally, involve more than the simple pairing of stimuli and responses. Nor does the introduction of inferred mediation responses (verbal or otherwise) account for the complexities of observed changes in behavior organization during the years 3 to 8 (Bloom, 1965; White, 1965; Piaget, 1967). Modern psychological theorists have adopted, in one form or another, the idea that human organisms actively respond to their environment and that the patterning of these responses reflect a plan (Miller, Glanter, Pribram, 1960), a schema (Hunt, 1961), or cognitive operations (Piaget, 1952). In other words, the child interprets the environmental input, and his interpretation is based on available modes of representation (e.g., Bruner, 1966: inactive, iconic [imagery], symbolic) as well as on his capabilities for coordinating and transforming the input (cognitive operations or actions) to match the schema or plan (Hunt, 1961).

Early educational stimulation, then, requires an understanding of two basic processes, both characterized by relatively rapid change between 3 and 8 years of age. First, we need to know more about the child's changing modes of representation of physical and social environment. Analysis of this problem requires systematic study of the conditions that facilitate or inhibit the selection, storage, and retrieval of information concerning the properties, and patterning of properties, of environmental objects and contingences. Such studies need to focus both on characteristics of the environmental events (concreteness-abstractness, spatio-temporal patterning) as well as the psychological processes involved (i.e., perception, imagery, symbolization).

Secondly, the characteristics of the child's rule systems for interpreting the environment undergo transformation during this period as indicated by a large body of evidence relevant to problem-solving, reasoning, and concept formation (Sigel and Hooper, 1968). The analysis and experimental study of the conditions that facilitate the acquisition, retention, and generalization of these rule systems constitute a basic problem for early educational programs.

The concept of "rule-system" is not, in itself, of much explanatory or descriptive value. It is a common sense substitute for the general notion that something like a "plan,""schema," etc., is a necessary construct for understanding cognitive development. It does not preclude behavioristic theory (Berlyne, 1965), nor maturationistic conceptions of development (Beilin, 1969). However, the direct analysis of "rule-systems" characterizing cognitive development requires specification of the acquisition of "rules" and their "structures" as systems with specified properties (Inhelder, Bouvet, Sinclair, Smock, 1966). The study of the development of "rule-system" refers, then, to the systematic investigation of the "inherent logic" of cognitive operation

(functional-action modes) in the child's adaption to his environment--physical, social, symbolic. The theory of the development of psychological, and analytical methods of Piaget (e.g., 1952, 1968) provide a basis for the beginning of such analysis.

The combination of the study of knowledge acquisition and child development (genetic epistemology) represents a philosophical position with a long history, but only recently has its scientific implications for psychological theories of human development and education been recognized (Smock, 1959, 1962; Beilin, 1965; Berlyne, 1965; Bruner, 1966). Kohlberg (1968) for example, identifies three lines of thought on education that have characterized preschool educational programs. The maturational view holds that the most important process in the development of children is the intrinsic physiological-biochemical; thus, the pedagogical environment should be one which creates a climate that allows the inner "goods" to emerge (rosebud theory). The empirical-behavioristic tradition emphasizes that the child must learn the conventional-normative cognitive (and moral) knowledge and rules of the culture. The child learns through "mechanical-mirroring" of the environment and thus must acquire the adult's cognitive knowledge and social rules by direct instruction of such information and rules (Bereiter and Engleman, 1966).

The third line of educational thought is represented by those child-development psychologists (from James Mark Baldwin and John Dewey to Jean Piaget) who have been influenced by the theory of evolution and general biological view of man. Cognitive and affective structures which education should nourish are, according to these theorists, natural emergents of organismic adaption processes which are understandable only by considering the <u>interaction</u> between the child's capacities and his environmental conditions. Preschool education, therefore, should be designed to foster the emergence of modes of adaption through appropriate provision for an <u>active interaction</u> of the child with both the physical and social environments.

The view that controversy inherent in these positions, due to recent theoretical and empirical advances, was resolved, and thus an appropriate subject for historical analysis (Smock, 1967) proved to be wrong. Current literature in early childhood education and development (Kohlberg, 1968), as well as psychology (Jensen, 1969), indicates that the nature-nuture issue is entering a new cycle of rethinking. The revival of the controversy is due partially to the nature of the questions asked (e.g., Can three-year-olds learn to read?) and partially to the fact that the mechanisms of cognitive development and early learning are not yet clearly specified. The functional-genetic orientation, best represented in the epistimological and psychological theories of Piaget (Flavell, 1963), provides a conceptual frame of reference in which more appropriate questions regarding these mechanisms might be posed.

The critical assumptions underlying the interactionists point of view are as follows:[1]

1. Intellectual or cognitive development is a product of differentiation and hierarchical integration of cognitive structures under the pressure of intrinsic (maturational) and extrinsic (physical and social) environmental events. Intelligence, then, refers to modes of action on objects and/or internalization of such actions; intelligence is defined in terms of functions rather than contents (i.e., words, verbal responses, associations, memories, etc.). Psychological analysis of cognitive development must begin with the identification of components of behavioral organization that reflect particular action-modes of the child as he is confronted with changing intrinsic (maturational factors and prior cognitive acquisitions) and extrinsic (physical and social) factors.

2. Cognitive functions (modes of actions) proceed through invariant stages of structural reorganization. The successive differentiation and hierarchical integration of these cognitive structures proceed in an invariant sequence and permit the individual to cope with increasingly complex social and physical "realities."

3. The process of cognitive development, then, involves the changing characteristics of the transformational rule systems (virtual and/or cognitive operations) characterizing the child's mode of adaption and determining his learning characteristics. Neither the maturational structure in the organism nor the "teaching" structure of the environment is the source for such reorganization. Rather, it is the structure of the interaction between the child and the environment that provides the conditions of cognitive growth.

4. The optimal condition for structural organization and reorganization is an optimum balance of discrepancy between the behavior (action) structures of the child and the structures of his psychological (i.e., perceptions, images, memories) environment.

5. Finally, both the cognitive and affective domains represent parallel aspects of the structural transformations undergone in the course of psychological development.

Structural change, then, depends upon experience, but not in a way that learning theorists generally conceive experience; i.e., learning has been interpreted as resulting from pairing of specific objects,

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[1]Numerous sources supporting the following are available, but see Kohlberg (1968) and Smock, (1967, 1968, 1969).

responses, direct instructions, modeling, etc. In effect, the functional-genetic view holds that the child's cognitive categories determine the effectiveness of training rather than the reverse. For example, ability to solve class-inclusion problems implies that the child already has the requisite single and multiple classification schema and relevant cognitive operations (i.e., combinativity, reversibility, etc.).

The interactional conception of stages differs from the maturational one in that experience is necessary for developmental progress and that more appropriate rich stimulation can accelerate, but not change, the structure of sequence of emergence of each stage. Thus, Piaget's theory differs from the environmentalistic position that organization of experience is not provided solely by the environment, but the environment is assimilated to the particular modes of action characteristic of a particular developmental level.

The methodological implications of the Piagetian position for understanding the role of experience in child development is most succintly stated by Kohlberg (1968) as requiring:

(a) an analysis of the universal features of experienced objects whether physical or social (e.g., permanence of objects, characteristics of spacial relations, social-environmental contingencies, etc.);

(b) an analysis of the logical sequences of differentiation and integrations of the concepts of such objects (e.g., quantity, space, causality, etc.); and

(c) analysis of the structural relations between experienced input and relevant behavioral organization (e.g., conservation of length requiring that the effects of perceptual transformations be overcome).

Two themes crucial to the understanding of early education occur in Piaget's theorizing concerning cognitive development: invariant sequence of stages, and hierarchical integration of separate systems of cognitive operations. Data available up to the present time offer greater support for the invariant order of stages than for the integrative and hierarchical nature of cognitive structures. Studies involving acquisition of particular conservation concepts (quantity, number, space) generally indicate results consistent with those reported in the original studies of Piaget and his colleagues. Together they indicate a series of sequences in which the capabilities of children develop as they deal with the different substantive areas. However, the investigations do not offer definitive proof of invariance since methodologies employed have not yet provided a crucial test.

It follows from the set of assumptions presented above that invariance of stages must be considered from two frames of reference. One frame is based on the interlocking nature of the substantive (space, number, classes) material. In many areas of knowledge one has to proceed from the simple to the complex. This would hold true in the study of physical science, language, and mathematics where there is an inherent logic to the material; certain bits of information are necessary precursors to subsequent knowledge. The interlocking of these "contents" is independent of the psychological state of the persons involved.

The second frame of reference in which invariance must be examined is in terms of the psychological-cognitive processes and operations. These operations are expressed behaviorally by the manner in which a child responds to the conceptual material; i.e., psychological operation can be identified. Such mental operations as associativity, reversibility, or combinativity can be inferred, for example, in the context of class-inclusion problems, conservation of quantity to area, and certain systems of event ordering (e.g., transformational geometry). Considerable evidence (Sigel and Hooper, 1968) supports the notion of invariant order of the cognitive systems, but few prior studies provide the kinds of methodological sophistication necessary for definitive conclusions. In fact, it is necessary that more appropriate methodologies for testing the invariance hypothesis be devised. In particular, experimental studies rather than descriptive ones are necessary if generalizations and application to early educational environment are to be fruitful.

Intervention in the hypothesized sequence of acquisitions is necessary to determine if cognitive structures can be instituted with permanence and with no deleterious effects on other cognitive functions. For example, the consequences of intervention may interfere with cognitive growth in such a way as to impede acquisition of other necessary structures. It is for this reason, among others, that Piaget has not been excited about <u>acceleration</u> of cognitive development.

The second critical theme in Piaget theorizing is the presumed hierarchical and integrative nature of cognitive growth. Results of investigations centering on this issue (Beilin, 1965; Braine, 1959; Dodwell, 1962; and Shantz and Smock, 1966) tend to be equivocal. However, each of the studies has explored different combinations of interlocking sets of cognitive operations. The issue bears directly on significant problems in early childhood education (for example, what sets of experiences and acquisitions are really necessary for cognitive-development progression?), and considerably more attention should be devoted to it.

The integrative nature of cognitive growth has not been confirmed in the strict sense but neither can we reject such a thesis (Braine, 1959; and Doswell, 1962). Several strategies suggest themselves, but a good starting point would be the "retrospective" type experiment of Hooper and Sigel (1968). In that study, children identified as "conservers" did not represent a homogeneous group when presented with logical matrices and seriation problems. The data suggest there may be alternative antecedents to acquisition of particular "conservation" concepts which, however, conform to the convergent nature of operational thought structure.

Despite the current theoretical and research interest in cognitive growth and early educational stimulation, the most poorly defined set of variables influencing the course of cognitive development remain those included under the rubric of "experience." Piaget does acknowledge the significance of the environment as a stimulant and the role of linguistic systems on the quality of emerging logical thought (Inhelder & Piaget, 1958). Specification of the kind of quality of experience that facilitates or inhibits development of early logical thought, from the sensory-motor to the concrete-operational stage, is far from complete. Cross-sectional studies have contributed to increased general understanding of the role of experience, but until appropriate methodology is employed (Gollin, 1965), specific delineation of the factors within the environment (physical, social and educational) cannot be accomplished. The emerging set of data from cross-cultural studies (Goodnow, 1962; Gladwin, 1964; Triandis, 1964; Sigel and Mermelstein, 1965; Greenfield, 1966) offers several clues to greater particularization of the environmental and experiential variables that have educational significance and could be subjected to experimental investigations and translated to instructional procedures.

Piaget and Inhelder maintain that cognitive structures are consistently reinforced by the syntactical structure of language, at least in the acquisition of classification (1963). If syntactical structures influence thought structures, and if children from different cultures experience different syntax, variation in solution to "Piagetian" tasks may, in part, be due to those structural differences in language environments.

Language does not play a similar role throughout the developmental period; however, its significance depends on the child's capabilities of differentiating, interpreting, and integrating language elements. Evidence to support this proposition is provided by Beilin's (1965) training study which indicated that language is a relevant variable for inducing those cognitive reorganization-characterizing transitions to the concrete operation period (5-7+) in (concept of area) but may not aid in the acquisition of understanding of seriation (Sinclair, 1969), not did verbal rules aid the child when he was confronted with perceptual tasks. The role of language as a determinant of cognitive

behavior must be distinguished from the role of language as facilitating cognitive learning (e.g., mathematical or science concept) of the young child.

Finally, Piaget has discussed in several places the significance of social interaction and play in helping the child acquire appropriate conceptual and representational schema (Piaget, 1951). Of particular relevance in the Georgia R&D program are the kinds of play in which the child engages, the kinds of material available to him, and the mode of utilization of these materials. "Play" provides the child with a major means of interacting with the physical and social environment and of obtaining information about environmental contingencies and uncertainties. The differential play behavior of children in subcultures should provide initial information on factors related to later learning characteristics and difficulties in school. For example, a lower-class child who impulsively moves from one object to another and does not attend to details should differ from the more reflective child who engages in more extensive manipulative and exploratory behavior. The information obtained by the two children will differ both quantitatively and qualitatively; i.e., information about the multiple properties of the object, the interrelationship of properties, invariant characteristics, and multiple functions of the object. Sutton-Smith (1967) has suggested, for example, that a highly energetic and exploratory child, playing with a limited number of toys, may acquire more conceptual information (i.e., invariant properties) because the circumstances of having a few toys force him to use the same objects in a variety of ways, and thus he is exposed to its invariant properties.

Objectives

The objectives of the Center are two:

1) to provide systematic information on the environmental and experimental variables that influence the development of logical thought in children aged 3 to 8 years. The achievement of this objective will be accomplished by experimental analysis of the effects of specific variations in the physical, linguistic, and social environments on cognitive-development transformations in the modes of concept acquisitions (concept learning) as reflected in the changing structure of cognitive operations (i.e., rule system). Initial emphasis will be placed on the environmental (e.g., spatial-temporal patterning and information types) and experiential determinants of acquisition of the "conservation" concepts appropriate for early cognitive learning in language, mathematics, and social studies;

2) to construct and test prototypical instructional models, based on the research findings, for early education in mathematics, language, and social studies. The achievement of this objective will be accomplished by translating these effective experimental treatment conditions into curriculum materials and procedures and by evaluating formative and mastery level) the effectiveness of these prototypes under educational conditions.

IV. LINES OF INQUIRY

The cognitive-developmental approach explicated above, together with the objectives, suggest several lines of inquiry for research and development for children aged 3 to 8 years. The examples presented will undergo modification based on a detailed analysis of the specific cognitive processes and curriculum development problems (for children 3 to 8 years) in the substantive areas. Certain lines of inquiry, however, are crucial and of general significance for better understanding of cognitive development and learning relevant to early childhood education.

1. What is the role of information types (and their patterning or sequence) with regard to acquisition of cognitive operations underlying the "conservation" concepts (e.g., the condition which optimizes the effectiveness of behavioral, figural, semantic and/or symbolic information on acquisition, retention and generalization of concepts)?

2. What are the social experience variables that facilitate or inhibit cognitive development and learning (e.g., studies of role taking, experience with multiple roles of people, etc.)?

3. What is the impact of sequence of acquisition of selected concepts on subsequent concept learning and cognitive operations (e.g., class, number, etc.)?

4. Do the sets of cognitive operations underlying acquisition of conservation concepts in the same-or-different-event domains (substantive areas) converge (i.e., higher order integration) and thus permit generations to new substantive areas?

5. How can development of appropriate theory and methods for assessing cognitive developmental level be expressed in terms of the "action modes" (i.e., cognitive operations rather than "what's in the store-room?")?

V. IMPLEMENTATION OF LINES OF INQUIRY

The Georgia R&D Center is oriented toward an analysis of the processes of cognitive development and learning during the period 3 to 8 years. The goal is to specify the nature of preoperational and concrete operational thought (according to Piaget, but not exclusively) and to determine the most effective condition in the physical, social, and linguistic environments for creating educational settings most appropriate to the emergence of these processes.

The lines of inquiry, following from the rationale stated earlier, indicate that our concern is with:

1) The sequence of emergence of different cognitive acquisitions. The methodological implications of this interest involve specification of the expected sequence (a priori and available knowledge base) and experimental design that permits inferential statements relevant to developmental change. The methodological imperative of developmental theories, and suggestive designs, are available from several sources (e.g., Smock, 1963; Gollin, 1968; Solomon & Lessor, 1968).

2) One initial strategy involves the intercorrelations of different cognitive acquisitions at different developmental levels to "map" the possible, necessary, and sufficient precursors of single and/or multiple cognitive acquisitions of the target populations. The experimental analysis (see 1 above) can then proceed with more definitive information regarding the specific experiential factors necessary for developmental change.

3) The descriptive studies (intercorrelations) are needed to obtain information on possible environmental factors related to the specific process. Previous research on subcultural and cross-cultural cognitive characteristics provide a starting point for defining the specific variables and processes to be studied. Our work will include descriptive specification of both typical and disadvantaged populations in order to provide extension of prior research and the base for cumulative information for development of curriculum based on understanding of the specific environmental factors related to cognitive growth.

4) Concurrent analysis of the environments and experience of children in different cultures (or subcultures) can provide additional and converging information about precursors and developmental rate variations.

5) The strategy described should provide optimum information for the development of a process approach to early childhood education. The Georgia R&D Center's curriculum development activities will be based on the basic and prototypical educational research relevant to early cognitive learnings that emerge from the theoretical developmental

psychology considerations as related to mathematics, language, and social studies. Psychological analysis of logical thought may be "content free," but environmental stimulation is a necessary condition for cognitive growth. The role of the different event-domains for the facilitation of cognitive growth is not yet clear by any set of criteria. (Study of nonsense syllables, for example, may well lead to a theory about non-sense: Pardon me, Henry). Piaget and the Geneva group have been primarily concerned with adaptive pressure inherent in the physical environment. Relatively little attention has been devoted to the study of the influence of the social and linguistic environments or to the effects of specific training in the developmental structuring of logical-mathematical experience of the physical events through direct training (i.e., mathematics).

As indicated in the rationale an objective is the analysis of the role of experience in cognitive development, and of the sequential structure of the different conditions relevant to developmental transformation. The substantive areas, then, provide the opportunity for the study of the development of cognitive process (e.g., convergence, etc.) and, at the same time, they can provide information about the acquisition of specific concepts and possible varying impacts of the different event-domains on cognitive processes.

Mathematics, for example, needs to concentrate on the development of symbol systems through acquisition of concepts of space, time, number, class, etc.

Social studies must concentrate on concepts relevant to the social environment (i.e., moral judgment; role definition, play and imitation; family-social relations; and language), on both the development of a flexible and differential verbal system, and on the analysis of the impact of language environment on cognitive growth.

6) The first two years, while overlapping with developmental activities, will be required to complete some of the descriptive studies of the intercorrelation of conceptual processes at ages 3 to 8 years in different subcultures. During this period, reviews of literature and selected experimental studies would be completed to extend the knowledge base appropriate to the substantive areas. Included would be specifications of the relevant conceptual process(es) and presumed environmental and experiential variables necessary for the relevant acquisition.

The third year would be devoted to further experimental analysis and preliminary development of prototypical educational models.

The foruth and fifth years would be devoted to continuing experimental study and development (with formative evaluation and field testing). The prototypical models would be designed with special emphasis on the requirements of more relevant educational environments for disadvantaged children aged 3 to 8 years.

VI. ILLUSTRATION OF PROGRAM ACTIVITIES

A. Introduction

The criteria for selecting line or lines of inquiry to be pursued, and the planning of specific research and development projects to be initiated involve a complex decision process, including knowledge base retrieval (see Planning System, Section II). The two-fold objective of the Center--contributing to a better understanding of early cognitive developmental processes and translation of this knowledge into prototypical educational packages, together with the emphasis on mathematics, language, and social science yields multiple starting points and strategies for solution of problems of early childhood education. Specifically, a particular project might be initiated because it contributed to: (1) new information on a basic (and general) problem of early cognitive development (e.g., sequence of concept learning); or (2) information about a special problem of learning in a substantive area (e.g., symbol system learning in mathematics); or (3) information on the coordinated impact of language, mathematics, and social studies on a specific cognitive process. The following projects were selected as illustrations of a particular cognitive process (classification) that provides for multiple entry points and which, through experimental analysis, should yield converging information about the process as well as the necessary information for constructing prototypical instructional units that can be coordinated in order to maximize learning.

The classification process is recognized as basic to conceptual learning and, in fact, to reasoning. Many psychologists have been content to accept classification as a given, and then study the role of classification in the reasoning processes (e.g., syllogistic reasoning). Piaget (1963) however, has been interested in the origin of classification as well as its role in deductive and inductive reasoning. The achievement of concrete operational thought (about CA 7-9) is signaled by the ability to handle class inclusion, multiple classification, and hierarchical classification problems. The "mental operations" underlying these skills (combinativity, associativity, reversibility) constitute the basic properties of a "grouping" structure applicable to the acquisition of a number of other cognitive acquisitions (e.g., number concept, space relation, etc.). The developmental projects described below can, therefore, be viewed as studies in the efficiency of different media for facilitating "conservation of classes." Concurrently with these studies, an examination of the generality of the acquisition can be determined by analysis of classification ability across these "interests" and achievement of operational thought in other (Inquiry 3&4) relevant domains (e.g., conservation of area, etc.).

B. Language

Planning steps in the language program could cover:

1. Selection of processes to be included

2. Definition of processes by developmental psychologist and subject area specialist

   (a) Simple classification defined as a process in which objects or events are sorted on a single dimension or characteristic

   (b) Statement of goals by developmental psychologist, subject area specialist, and evaluation representative, as follows:

      i. Subject gains control (transfer process to any other set of objects or events) of simple classification.

      ii. When presented with a set of spoken words, the subject classifies according to number of syllables, or according to rhyming final phoneme sequences, or on any other single dimension, after class inclusion and restriction limits have been taught to him (behavioral outcome).

      iii. Criteria indicating that goals have been attained, e.g., 90% success on three transfers of simple classification process tasks (all evaluation criteria are jointly established by psychologist, evaluation specialist, and subject area specialist).

   (c) In the field of language, this process could be considered as manifested--by the subject area representative and the developmental psychologist--if the subject declares the tense of a regular verb; finds alliteration and rhyme among words, in form class sorting and clustering, in singular and plural sorting, and in establishing the set of sounds which he learns to pronounce and attempts to interpret; in classifying letters (graphemes) in terms of phonemes (sound) represented, and in classifying forms as letters (graphemes), etc.

(d) Child and environmental variables related to the attainment of this goal would primarily include:

i. Child Variables

Age

Auditory acuity

Speech muscle strength and coordination

Intelligence

Present language characteristics

ii. Environmental Variables

Language or dialect spoken by mother and siblings

Nature of parental expectancies and reinforcement of language

Complexity of situational variables in environment

School and instructional variations

Class size

Instructional treatments and sequences

Pacing

(e) Relevant and feasible variables selected by teams, (evaluation, subject area, psychology) might include:

i. Age

ii. Intelligence

iii. Present language characteristics--dialect morphology rules mastered, reading competencies, etc.

iv. School and instructional variables

Response type

Feedback provision

Treatment content and presentation mode

Content sequence

Reinforcement schedule

Class size

(f) Other variables listed in (d) will be blocked by sample selection. Selected variables might include:

i. Present language characteristics (selected on dialect)

ii. Age

iii. Intelligence

iv. Treatment content (standard English dialect)

v. Presentation mode (pattern drill, tape modeled)

vi. Feedback provisions (voice mirror)

vii. Class size (limited to equipment delivery capabilities)

viii. Reinforcement schedule (determined by the extent to which feedback reinforces subject's responses)

C. Sample Project in Mathematics

Process: Classification

Age Levels: 5 years to 9 years

Topic: Finite Mathematical Systems

The concept of a mathematical system is basic to the study of mathematics and to understanding the organization of mathematical knowledge. "A mathematical system is any nonempty set S of elements [a, b, c...], together with one or more operations defined on the elements of the set, and a set of axioms or postulates" (Willerding and Hayward, 1968, p. 121). In addition to these basic elements, mathematical systems typically include relations which may or may not be equivalence relations and extensions in the form of theorems deducible from the axioms.

There are normally many different concrete embodiments for which the axiom statements are true (in the scientific sense), and all theorems deducible from the axioms hold for these embodiments. A number of

different finite mathematical systems may prove to be appropriate for the task at hand. Possible examples are:

(a) The finite system presented by Veblen and Young (Newman, ed., 1956, p. 1697), the isomorphic copies of this system presented by Meserve (1953), and similar systems (Willerding and Hayward, 1968);

(b) Boolean algebras as described in various standard works (Allendoerfer and Oakley, 1955; Birkhoff and McLane, 1941), which are especially valuable because they treat classification in direct sense and have many concrete representations; and

(c) Finite groups discussed by Denbow and Goedicke (1959).

Any of these structures, together with a number of its isomorphic embodiments, would constitute a suitable topic from a mathematical point of view. The idea of class and classification is so universal as to be unavoidable in the study of mathematics. "The notion of a class of objects is fundamental in logic and therefore in any mathematical science." (Newman, ed., 1956, p. 1697). The use of classification can be seen clearly in the establishment of classes of elements as a basic structuring device within mathematical systems.

1. Presentation

In presenting these systems, full use will be made of the isomorphic copies of a single structure. This will extend the range of ages at which a system may be studied; from among the isomorphic copies of a system, concrete embodiments whose investigation will be carried on in the inactive mode, semi-concrete representations leading to operations in the ikonic mode, and abstract presentations leading to use of the symbolic mode will be chosen for use at appropriate age levels. It is anticipated that developmental psychology personnel will assist in the design of presentation strategies based on likely levels of cognitive functioning.

2. Classes and Classification

The cognitive process which is the focus of this project is classification. Since classes and classification are basic in mathematics and in logic, the connections are relatively clear and well developed.

(a) The establishment of classes within a mathematical system as basic elements of the system is a typical procedure. For example, in the finite system described by Veblen and Young (Newman, ed., 1956) the m-class is a basic notion. It is immediately relevant to ask in which m-classes a particular element falls. A similar question is relevant in each isomorphic copy of the system.

(b) The treatment of Boolean algebra is, by its very nature, a treatment of classes. The generality of this type of system permits the use of single and multiple criteria of classification as appropriate, and the large number of available embodiments increases its utility.

(c) The classification of propositions as "true" or "false" and the relationship between classes of propositions lead to deductive logic, the capstone of classification, mathematically.

3. Treatments

The treatments envisioned in the sort of project described above would vary over (a) types of mathematical systems, (b) age, and (c) form of presentation. Specific hypotheses concerning the effects of instructional type on the learning of content and the relation of this learning accomplishment to the child's success on classification tasks will be formulated during the design of the project.

3. Goals of Treatment (Behavioral Criteria)

The manifestation would depend on the child's level of representation and also be specific to a single finite system:

(a) i. The child can classify elements as "members" or "nonmembers" relative to a specified class.

ii. The child can produce the whole of a given class.

iii. The child can produce an example (member) of a specified class.

(b) The criteria for attainment will be a measure which is so specified that the probability of reaching criterion by chance is below some specified level.

Developmental psychologists identify process to be studied...

then...

Delineation of Problem

a) Single classification

b) "Community workers"

Subject-matter and evaluation specialist delineates context in which process will be studied... and advises on evaluation problems

STAGE I

To be determined by developmental psychologists and subject-matter specialists in the context of the Center's mission...then

Developmental psychologists specify behaviors...meet jointly with subject-matter specialist (and educational psychologist, if necessary) to determine learning strategies...then

Subject-matter specialists identify learning vehicle

Evaluation specialist advises re measurement problems

Specification of the Child and Environmental Variables

a) Prerequisite behaviors necessary to engage in single classification

b) Learning strategies to be used

c) Relevant specific learning vehicle ("police," "health workers")

d) Identification of population (age, sex, SES, etc.)

STAGE II

Subject-matter specialist (in concert with a child-care specialist, if necessary) prepares the instructional mode... then

Meets jointly with developmental psychologist and representative from evaluation arm to specify evaluation mode

Development of Instructional Sequence

a) Sequencing of learning activities

b) Developing evaluation mode

STAGE III

Team decides re criteria for modifying instructional and evaluation modes. Decisions, once made, may result in: (a) no modification of instructional sequence; (b) modifications to be made according to procedures established in Stage III; (c) cancellation of study

Field Testing and Revision

a) Refinement of prototypical instructional model

b) Refinement of evaluation mode

STAGE IV

Publications Division works out packaging problem with subject-matter specialist and practicing teacher...

Decisions made by developmental psychologist and subject-matter specialists

Translation into Prototypical Package

a) Nature of package components

b) Delineation of target consumers

STAGE V

3 Jan. '70 — 15 Jan. '70 — 1 March '70 — 30 May '70 — 30 Sept. '70 — 15 Dec. '70

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APPENDIX A

BACKGROUND

The official plan of the Georgia R&D Center at the time of the site visit (November 3, 1969) was the plan presented in the Program Plan for Fiscal Year 1970. A resume of that plan is as follows:

> The Georgia Research and Development Center in Educational Stimulation is one of nine R&D Centers in the United States. This Center is a cooperative activity of the Research and Development Branch of the Office of Education, HEW (57%); University of Georgia (30%); and the Clayton County (Georgia) public school system (13%). The annual budget is approximately 1.5 million dollars. The Georgia Center produces models for early educational stimulation designed to capitalize to an optimum degree on the child's early learning potential (beginning with three-year-olds).
>
> The purpose of the models produced is to make an effective attack on the most compelling educational and social problems facing our nation today. The Center's position is based on the conviction that early educational stimulation is a key to the solution of these problems and that there is need for complete education models rather than fragmented research and development projects.
>
> In seeking a degree of completeness in the models, the Georgia Center is organized around three coordinated programs: Substantive Programs (staffed by specialists in seven subject-area disciplines), Developmental Psychology, and Evaluation. The work of these three program dimensions is focused on a single program (Model A) in an experimental school in Clayton County (on the southern fringe of Atlanta). The Clayton Early Elementary School (formerly Arnold School) has an enrollment of 431 students, ages 3-8 years. The student population is designed to approximate a cross section of the nation.
>
> The first generation of a model is the result of knowledge base development in the Center. Once established, the model goes through a series of generations as a result of a constant system of evaluation and feedback. The process involves and is based on a system approach backed by modern computer technology. The system minimizes dependence on the extremely slow research techniques involving experimental and control groups. A major advantage is that there is always available for dissemination a complete model, representing the best the Center has produced.

Present program projections call for a second model (Model B) involving a disadvantaged population. Work on Model B will begin in FY71.

If it appeared to the Site Visit team that the Center was without a plan, this may have been due to a decision reached in October, 1969 by the R&D Center (the month between the completion of the Program Plan and the Site Visit) to shift to a child-centered program. This meant that there had not been time to commit to a paper all the implications of that shift.

The program plan submitted immediately prior to the Site Visit deserves explanation. Since July, 1968 (when the present director joined the Center as coordinator of the seven subject areas), the Center had been working toward a programmatic focus. After the meeting of the National Advisory Council in the spring of 1968, it had been accepted by all concerned that the work of seven subject areas should have a common focus; and that the input from Developmental Psychology and Evaluation should be materially strengthened. From January, 1969 onward, coordination in the subject areas and strengthening of Developmental Psychology and Evaluation had proceeded at a rapid pace.

There were, of course, many problems to be solved. Difficulties were encountered in attempting to coordinate the subject areas through the identification of common elements and content interfaces. Weaknesses were exposed when attempts were made to tighten the evaluation scheme. Obstacles were met in trying to find the best input point for Developmental Psychology. The Center began to veer toward a shift from beginning points within the structures of the several subject areas to beginning points within the child, specifically the cognitive processes.

This shift had been foreseen. But in order to implement the shift in time to commit plans to paper before the Site Visit a fiat would have been necessary. The consequence then would have been to halt the substantive progress toward the major administrative and organizational goal of the Center, i.e., the achievement of a true interdisciplinary effort that more than samples the power and know-how of a large university. The very idea of locating R&D Centers on university campuses assumes a type and degree of input by experts and scholars that would not be possible in a private corporation. Yet, this obvious advantage is not automatic. R&D Center officials have recognized, almost from the first that effective use of university know-how and interdisciplinary cooperation is not a given but a prize that is very difficult of attainment. Two specific experiences of the Director of the Georgia R&D Center have reinforced--both positively and negatively--his attitude in this matter:

1. During eight years (1957-1965) as Associate Dean of the College of Education, Florida State University, his assignment was to make the College of Education a true part of the university and to cause the College to draw from other parts of the university

maximum support for teacher education (a problem that parallels closely that of R&D Centers). In areas where intercollege and interschool cooperation was accomplished, there was marked improvement in the quality of students seeking admission. The recruiting of top-grade faculty was made much less difficult.

2. Two years (1965-1967) as AID advisor to the Ministry of Education, Ethiopia, impressed on him the debilitating effect on creative effort of autocratic administration in a closed system.

The move toward true interdisciplinary effort at the Georgia Center has been proceeding as fast as possible without internal collapse. These experiences, backed by the belief that a superior organization along the lines of the idealized R&D Center was in the making, caused the Center Director to refrain from making the decision to shift to a focus on cognitive processes.

The events which immediately preceded the decision to make the shift to the cognitive process platform may be mentioned here. As has already been pointed out, the direction of the growth of the programmatic focus had been established for some time. It was supposed that the critical shift would be made during the fiscal year 1970 after the Clayton County model was well established and planning was underway for the disadvantaged model (see resume at the beginning of this Introduction). The surprise was that the opportunity for the shift came when it did. Important events which precipitated the shift at that time were:

1. The Center was faced with two demands that seemed to be in direct conflict: (a) to strengthen to a significant degree the Developmental Psychology and Evaluation components of a program that had as its very base curriculum work in seven subject areas, and (b) to produce a plan for fiscal year 1970 at 90% (federal financial support) of the 1969 level of support. A well-planned program for FY 1970 was worked out with appropriate emphasis on Developmental Psychology and Evaluation. For this plan, it was calculated that a federal budget of $1,300,000 would be required. (The official funding level for FY 1969 was $815,000. The 90% figure, required by R&D/Washington was $733,500.) This was reduced to $1,090,000 by proposing for the Center an austerity level of operation and deferring a real emphasis on Developmental Psychology. Evaluation was retained at a level adequate for the program proposed. It was agreed that further cuts could not be made without destroying the broad subject of the program. To abandon the recently developed Evaluation program would have been fatal in terms of the Center's development. The lesser of the evils was to propose a program plan for FY 1970 at the $1,090,000 level. This was done. It was promptly rejected by R&D/Washington.

2. The Center had projected two models in its five-year plan: (a) the Clayton County model and (b) a disadvantaged model using a local population. A tentative budget was constructed at the required $733,500 figure. This plan would cut out four of the seven subject areas (destroying the concept of completeness in the model), reduce the age span of the target population from 3-12 years to 3-6 years, close out the Clayton County model as soon as possible while retaining some degree of continuity, and shift to a concentration on the disadvantaged model.

3. At this point the coordinators for language arts, and mathematics were brought into the intensive planning sessions. Up to this point the group had included the Center Director and the three Associate Directors (for Substantive Programs, Developmental Psychology, and Evaluation) as well as Dr. Kathryn Blake and Dr. Charlotte Williams who were serving as consultants in the absence of an Associate Director for Evaluation. The composition of the intensive planning group now was as follows:

Dr. Eugene Boyce, Director

Dr. Everett Keach, Associate Director for Substantive Programs and Coordinator for Social Science

Dr. Charles Smock, Associate Director for Developmental Psychology

Dr. George Mason, Coordinator for Language Arts

Dr. William McKillip, Coordinator for Mathematics

Dr. Charlotte Williams, Consultant for Evaluation

Dr. Kathryn Blake, Consultant for Evaluation

Dr. Stanley Ainsworth, Associate Dean for Research and Graduate Studies, College of Education

The primary task of this planning group was to construct a program within the limits of a $733,500 budget, while retaining a high degree of continuity with the Center's history.

4. During this intensive planning period the decision was made to complete the shift from a platform centered in the structure of the several subject disciplines to a platform centered in the child, specifically: cognitive process. This was a critical change, but not a change that might interrupt the normal growth and development of the Center. Only the timing was not predicted. The timing was dictated by a combination of circumstances over

which the Center had no control. The planning group deliberately chose to move to the new emphasis well knowing that it was not possible to produce in the short time available a satisfactory and acceptable plan for the implementation of the decision.

APPENDIX B

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Washington, D. C. 20202

Dear Dr. Mason:

This letter is designed to acquaint you with our continued progress in developing a more complete and detailed plan for the Georgia R&D Center. We provided the supplementary material for you on November 21, 1969, with the awareness that continued planning and specification would be necessary. For instance, we needed to be more explicit regarding a "plan for planning", particularly in clarifying how research and development would interact and how they would be essentially unified for any product of the Center.

We have approached this problem by developing two types of organization--one which presents the formal, line-responsibility framework; the other which established the functional format for planning, operations and outcomes. The accompanying chart presents the primary aspects of the formal organization.

Rather than discuss the entire formal framework, we call your attention to some significant additions and changes. First, there will be a Center Monitoring Committee. This committee will be responsible to the University Advisory Board for periodic review of the Center in order to insure that it continues to proceed efficiently and effectively to fulfill its mission. This committee will be composed of outstanding faculty members from various disciplines within the University. We expect to have outstanding representatives from child development and early childhood education, psychology, curriculum theory, educational psychology and evaluation, with a chairman from the office of the Vice President for Research. These individuals will have work-load time for this responsibility. The concept has been approved administratively, and the selected individuals will be contacted in the next two days. This Center Monitoring Committee will have access to anyone in the Center for obtaining necessary information. They will prepare at least two formal reports per year for the University Advisory Board.

The present coordinating committee will be designated the Executive Committee. To the areas of Developmental Psychology and Educational Development (presently called "Substantive Programs"), will be added the area of Information Services. Information Services coordinates the operational and management systems with the program planning aspects of the Center. The Executive Committee will have responsibility for forward planning and for ultimate decision-making with respect to program priorities, resource allocation, staff selection, etc.

Major progress has been made toward development of the functional organization, which is designed to insure the integration and unification of the research and the development aspects of the program. The process inherent in the functional organization is designed to maximize the likelihood that developmental activities will generate relevant research and, conversely, that research will lead to appropriate educational development. The following is a brief and partial description of how this will take place.

As described in supplemental material of November 21, we will have two regularly scheduled seminars. These are identified as (a) the Theoretical Issues Seminar and (b) the Research Planning Seminar. The Theoretical Issues Seminar will provide a forum for presentation and discussion of issues inherent in our conceptual scheme which is concerned with the growth of early logical thought. Also, this seminar will provide the basic structure for the matrix of studies and products which will comprise the total program of the Center.

The Research Planning Seminar, in turn, will provide the substance of the matrix. Simultaneously it will establish a sequence for the conduct of studies and specify the outcomes to be expected. The details of the matrix and the sequencing will be achieved through this systematic process which involves the continuous interaction of those responsible for the developmental psychology aspects, the educational development functions, and the evaluation activities. This process would operate somewhat as follows: the Theoretical Issues Seminar would generate areas needing study. Individuals or groups (two or more individuals) will formally present brief written proposals to the seminar. These proposals for studies and/or end products will include objectives, basic design, outline of procedures, estimate of resources needed, anticipated outcomes. In addition, and of crucial importance, the proposals are to provide the rationale for relating to the cognitive process under study and/or the anticipated prototype of instructional models, and the location in the total matrix. The Seminar will discuss and evaluate each proposal and suggest modifications regarding content or procedures. If necessary, a revision will be requested. Eventually a decision to include or exclude from the total matrix will be made by the group. Also, a priority will be recommended. These decisions will be sent to the Executive Committee for final disposition. Systematic records of all proposals and decisions will be kept as a summary of activities of this Seminar. This record, in turn, will provide a basis for future discussion, and will become a part of the monthly summary for the Center Monitoring Committee. The focus of the work of the Seminars will reflect the stage of development of the matrix and will encompass other research and planning issues. In this way the Seminar will provide a method for modifying activities appropriately throughout the next five years.

During this intensive planning period we have actively considered many other aspects of our planning and operational strategies. Our discussions have included items such as: use and scheduling consultants, a conference series, recruitment of staff, decision making strategies, and systems for resource allocation. Consultants, Irving Sigel and David Elkind in psychology and Frank Banghart in systems development, have been scheduled for January.

Sincerely,

Eugene M. Boyce

Eugene M. Boyce
Director

EMB:shc

cc: Dr. Hejlm
Dr. Ainsworth
Dr. Williams

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C. 20202

December 30, 1969

Dr. Eugene M. Boyce
Director, Research and Development
Center in Educational Stimulation
University of Georgia
Fain Hall
Athens, Georgia 30601

Dear Dr. Boyce:

The National Center for Educational Research and Development (NCERD) has completed its annual review of the Research and Development Center Program. This year's review process included site visits to each of the R&D Centers by OE staff and teams of specialists from outside the Office of Education; a meeting of the chairmen of each of the review teams in Washington to discuss the recommendations which resulted from those reviews, and a meeting of the National Advisory Committee on Educational Laboratories who reviewed the recommendations of the OE staff and the review teams on December 12.

As you know, the five-year review of the Georgia Center for Research and Development in Educational Stimulation had two major purposes:

1. To assess the performance of the Center over the past four years and the potential for future performance to determine whether the Office of Education should extend its five-year commitment to the Center.

2. To gather information about the Center's programs in order to insure accurate understanding of the objectives of those programs, the strategies and activities being used to achieve those purposes, and the accomplishments to date; to suggest strategies for strengthening the programs; and to assist the Office of Education in formulating FY 1970 funding decisions.

As a result of this review, and with the concurrence of the outside specialists and the National Advisory Committee, it is the Office's judgment that the performance of the Georgia Center does not warrant Federal support beyond the original five-year commitment. Accordingly, it is our intent to negotiate a phase-out budget with the University at a level not to exceed $339,000 for the period February 1, 1970

through June 30, 1970, at which time the Office will discontinue its support to the Georgia Center. The date for this negotiation is tentatively scheduled for January 20 at 9:15 a.m.

Howard Hjelm and I will be talking to you further about the next steps when we see you in Athens on Monday. Among other things, we would hope to have a preliminary discussion of the implications of this decision for the Center's budget and scope of work for the five-month period.

Sincerely yours,

Ward S. Mason

Ward S. Mason
Chief, R&D Centers Branch

cc: Dean Williams

RESEARCH AND DEVELOPMENT CENTER IN EDUCATIONAL STIMULATION
THE UNIVERSITY OF GEORGIA

PROPOSED SCOPE OF WORK FY70
January 19, 1970

The major objective of the staff of the Georgia R&D Center during the period February 1, 1970 to June 30, 1970 will be to terminate activities related to the USOE operation in compliance with USOE guidelines. The staff is ready to perform this function in a professional and systematic manner.

While necessarily seeking ways to terminate certain projects, major emphasis will still be a continuance of some of the ongoing research and development activities in a manner that will encourage individual researchers to further pursue these activities after June 30, 1970.

The Substantive Program will phase out its activities by completing those projects considered most viable for maintaining the curriculum in progress at the Clayton County Experimental School through the current year. Priorities for each project are as follows:

Art

1. Continue to develop and refine curriculum material and teaching strategies for ages 5 through 8.

2. Complete testing of Clayton County pupils in art classes (Grossman's Draw-a-Clown Test and Torrance's Test of Creativity).

When data have been evaluated, results will be disseminated through professional journals

Language Arts

1. Complete first field testing of Written Language, Levels A-f.

2. Continue development of an evaluation program for use in field testing the Early Stimulation in Oral Language program.

3. Complete field testing of Programming for Development Reading Comprehension Skills.

4. Continue development of the program for Acquisition of Cognitive Language Skills for Speakers of Negro Dialect.

Results will be incorporated into future experimental work of the investigators.

Mathematics

1. Develop three units needed to complete the first round preprimary curriculum. Tentative titles: Numerals, Relations, Operations.

2. Continue development of primary units for the introduction of nontraditional material.

3. Evaluate formatively primary and preprimary units now being field tested.

Disseminate results through journals and through addresses and conferences at professional meetings.

Music

1. Complete pilot testing of Music - A Structured Program for Very Young Children with children of ages 3, 4, 5, and 6.

2. Complete pilot testing of A Music Program for Young Children with children of ages 7 and 8.

3. Develop evaluation instruments for Programs 1 and 2 above.

Disseminate findings through professional journals and at meetings.

Physical Education

1. Evaluate and revise those units in physical education and health now in use in our experimental classes.

2. Determine instructional objectives for three- and four-year-olds and prepare an outline for a unit of instruction.

3. Gather baseline data, including reaction time, for three- and four-year-olds.

Disseminate curriculum and research findings through professional meetings and conferences.

Science

1. Complete pilot testing of the three parallel program variations in use with the four- and five-year-olds.

2. Revise the unit, Thermometers and Temperature, for six-year-olds.

3. Collect data for research study on sound discrimination with four-, five-, and six-year-olds.

Disseminate findings through professional journals and meetings.

Social Science

1. Pilot test the units, Change, Socialization, Social Control; revise unit, Interdependence for three- and four-year-olds.

2. Develop an evaluation mode for the units Change and Interdependence for three- and four-year-olds.

3. Disseminate project descriptions through professional journals and meetings.

The results will be incorporated into the future experimental work of the investigators.

Each of the Developmental Psychology projects is a part of the research program of principal investigators. These projects will continue after federal funding through USOE has been suspended. Selected but minor shifts in priorities will occur during "close out." At the same time, the activities during FY70 are ordered so as to be integrated with and make maximal contribution to the future research plans of each investigator. Results of the research activities will be submitted at professional conferences and to professional journals.

The program priorities are as follows:

1. Complete a theoretical and research paper based on prior R&D work relating to the early growth of logical thought processes in young children.

2. Summarize and analyze the implication of research projects conducted during the past two years in this program, outlining results.